

## 2. Carbon Dioxide Emissions

### Overview

#### U.S. Anthropogenic Carbon Dioxide Emissions, 1990-2005

	Carbon Dioxide	Carbon Equivalent
Estimated 2005 Emissions (Million Metric Tons)	6,008.6	1,638.7
Change Compared to 2004 (Million Metric Tons)	19.9	5.4
Change from 2004 (Percent)	0.3%	0.3%
Change Compared to 1990 (Million Metric Tons)	1,018.0	277.6
Change from 1990 (Percent)	20.4%	20.4%
Average Annual Increase, 1990-2005 (Percent)	1.2%	1.2%

Carbon dioxide emissions in the United States and its Territories were 6,008.6 million metric tons (MMT) in 2005, 19.9 MMT (0.3 percent) more than in 2004 (Table 5). The slow growth in emissions from 2004 to 2005 can be attributed mainly to higher energy prices that suppressed demand, low or negative growth in several energy-intensive industries, and weather-related disruptions in the energy infrastructure along the Gulf Coast. As a result, while the economy grew by 3.2 percent, energy consumption fell by 0.3 percent. The 0.3-percent growth in total U.S. carbon dioxide emissions from 2004 to 2005 followed an increase of 1.9 percent, or 113.4 MMT, from 2003 to 2004 (Figure 1). Since 1990, total U.S. carbon dioxide emissions have increased by an average of about 1.2 percent per year.

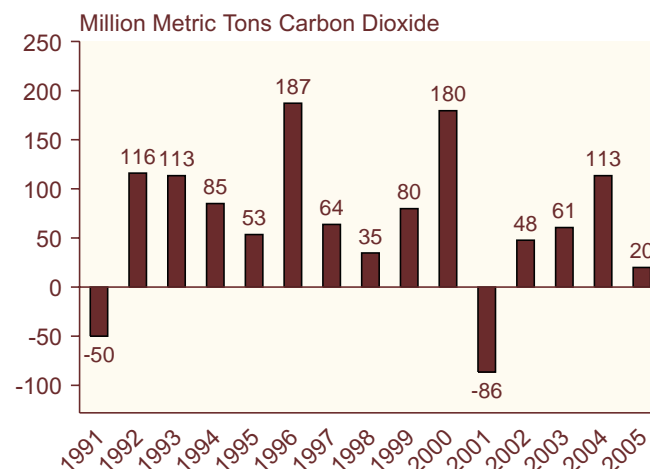
Carbon dioxide emissions represent about 84 percent of total U.S. greenhouse gas emissions. In the United States, most carbon dioxide (98 percent) is emitted as a result of the combustion of fossil fuels; consequently, carbon dioxide emissions and energy use are highly correlated. (The remaining 2 percent of carbon dioxide emissions comes from a variety of other industrial sources.) Historically, economic growth, the weather, the carbon and energy intensity of the economy, and movements in energy prices have caused year-to-year

fluctuations in energy consumption and resulting carbon dioxide emissions.

In both the residential and commercial sectors, 2005 energy-related carbon dioxide emissions were higher than 2004 levels (Table 6). In the residential sector, emissions of carbon dioxide increased by 3.3 percent, from 1,213.9 MMT in 2004 to 1,253.8 MMT in 2005. In the commercial sector, carbon dioxide emissions increased by 1.6 percent, from 1,034.1 MMT in 2004 to 1,050.6 MMT in 2005. There was little change in heating degree-days from 2004 to 2005, but cooling degree-days increased by 13.5 percent. Thus, higher demand for electricity—especially for air conditioning—was largely responsible for the increase in emissions from both sectors.

Industrial production rose by 3.2 percent in 2005, but industrial emissions of carbon dioxide declined by 3.1 percent, from 1,736.0 MMT in 2004 to 1,682.3 MMT in 2005 (Table 6). Trends in industrial emissions are driven in part by growth patterns in the six most energy-intensive manufacturing industries, which account for about two-thirds of total industrial emissions of carbon dioxide. Paper manufacturing, at 5.6 percent, was the only one of the six that grew at a rate greater than the overall gross domestic product (GDP) growth rate of 3.2 percent. (The paper industry is energy-intensive but uses a high proportion of biogenic material and, therefore, has the lowest carbon intensity among the six energy-intensive industries.) Two others grew by less

**Figure 1. Annual Change in U.S. Carbon Dioxide Emissions, 1990-2005**



Source: Estimates presented in this chapter.

than overall GDP (food by 2.3 percent and nonmetallic minerals by 1.6 percent), and for three output fell (primary metals by 2.7 percent, chemicals by 6.9 percent, and petroleum by 7.5 percent).

Estimates for 2005 indicate that carbon dioxide emissions in the transportation sector increased by 1.0 percent, from 1,939.2 MMT in 2004 to 1,958.6 MMT in 2005 (Table 6)—less than the 1.5-percent average annual growth in transportation emissions since 1990.

While net generation of electricity increased by 2.4 percent from 2004 to 2005, carbon dioxide emissions from the electric power sector increased by 2.8 percent, from 2,309.4 MMT in 2004 to 2,375.0 MMT in 2005 (Table 6). Accordingly, the overall carbon intensity of U.S. electricity production increased by about 0.4 percent. The higher carbon intensity resulted from an increase in the use of fossil fuels to generate electricity. In addition, generation from “non-carbon” nuclear and renewable fuels fell by 1.1 billion kilowatthours (0.1 percent).<sup>36</sup>

In this report, the electric power sector is defined as all utilities, nonutilities, and combined heat and power (CHP) facilities whose primary business is the production of electric power. Carbon dioxide emissions from generators that produce electric power as part of an industrial or commercial operation—that is, businesses that produce electricity primarily for their own use—are not included in the electric power sector total but are assigned to the industrial or commercial sector according to the classification of the business. In addition, the emissions totals reported above for the energy end-use sectors (residential, commercial, industrial, and transportation) include their shares of total electric power sector emissions.

Nonfuel uses of fossil fuels, principally petroleum, both emit and sequester carbon dioxide over their life cycles. In 2005, carbon dioxide emissions from nonfuel uses of fossil fuels totaled 106.4 MMT, a 4.7-percent decrease from the 2004 total of 111.7 MMT (Table 5). Nonfuel uses of fossil fuels also resulted in carbon sequestration equal to 300.9 million metric tons carbon dioxide equivalent (MMT<sub>CO<sub>2</sub>e</sub>) in 2005, a 3.3-percent decrease from the 2004 level of 311.1 MMT<sub>CO<sub>2</sub>e</sub>.<sup>37</sup> The major fossil fuel products that emit and sequester carbon include liquefied petroleum gas (LPG) and feedstocks for plastics and other petrochemicals. Asphalt and road oils are a major source of sequestration, but they do not emit carbon dioxide. It is estimated that, of the amount of carbon dioxide sequestered in the form of plastic, about 11.1 MMT was emitted as carbon dioxide from the burning of

the plastic components of municipal solid waste to produce electricity in 2005.

Emissions of carbon dioxide from other sources—including cement production, industrial processes, waste combustion, carbon dioxide in natural gas, and gas flaring—decreased by 0.2 percent, from 105.7 MMT in 2004 to 105.4 MMT in 2005 (Table 5).

## Energy Consumption

### Energy End-Use Sector Sources of U.S. Carbon Dioxide Emissions, 1990-2005

Sector	Million Metric Tons Carbon Dioxide		Percent Change	
	1990	2005	1990- 2005	2004- 2005
Residential	953.7	1,253.8	31.5%	3.3%
Commercial	780.7	1,050.6	34.6%	1.6%
Industrial	1,683.6	1,682.3	-0.1%	-3.1%
Transportation	1,566.8	1,958.6	25.0%	1.0%

Note: Electric power sector emissions are distributed across sectors.

The consumption of energy in the form of fossil fuel combustion is the largest single contributor to greenhouse gas emissions in the United States and the world. Of total 2005 U.S. carbon dioxide emissions (adjusting for U.S. Territories and bunker fuels), about 98 percent, or 5,903.2 MMT carbon dioxide, resulted from the combustion of fossil fuels. This figure represents an increase of 20.2 MMT from 2004 levels.

In the short term, year-to-year changes in energy consumption and carbon dioxide emissions tend to be dominated by weather, economic fluctuations, and movements in energy prices. Over longer time spans, changes in energy consumption and emissions are also influenced by other factors, such as population shifts and energy consumers’ choice of fuels, appliances, and capital equipment (e.g., vehicles, aircraft, and industrial plant and equipment). The energy-consuming capital stock of the United States—cars and trucks, airplanes, heating and cooling plants in homes and businesses, steel mills, aluminum smelters, cement plants, and petroleum refineries—changes slowly from one year to

<sup>36</sup>Included as non-carbon renewable fuels are hydropower, wood, solar, and wind. Both geothermal power and waste combustion produce some carbon dioxide emissions. Wood-fired generation is considered carbon-neutral so long as it does not lead to deforestation.

<sup>37</sup>Unlike emissions of carbon that occur in the form of carbon dioxide, carbon is sequestered in combination with other chemicals. Therefore, carbon sequestration is estimated in carbon dioxide equivalent units, rather than simply as carbon dioxide.

the next, because capital stock usually is retired only when it begins to break down or becomes obsolete.

The Energy Information Administration (EIA) divides energy consumption into four general end-use categories: residential, commercial, industrial, and transportation. Emissions from electricity generators, which provide electricity to the end-use sectors, are allocated in proportion to the electricity consumed in, and losses allocated to, each sector (Table 6).

## Residential Sector

At 1,253.8 MMT, residential carbon dioxide emissions represented 21 percent of U.S. energy-related carbon dioxide emissions in 2005. The residential sector's pro-rated share of electric power sector emissions, 885.7 MMT, accounts for 71 percent of all emissions in the residential sector (Table 7).<sup>38</sup> Natural gas accounted for 21 percent (261.7 MMT), and petroleum (mainly distillate fuel oil) represented 8.4 percent (105.3 MMT). Since 1990, residential electricity-related emissions have grown by 2.5 percent annually. Emissions from the direct combustion of fuels, primarily natural gas, in the residential sector have grown by 0.5 percent annually since 1990.

Total carbon dioxide emissions from the residential sector increased by 3.3 percent in 2005. Year-to-year, residential sector emissions are strongly influenced by weather. While heating degree-days were about the same in 2004 and 2005, a warmer summer in 2005 meant that cooling degree-days were up by 13.5 percent,<sup>39</sup> and the resulting increase in demand for air conditioning contributed to the growth in residential carbon dioxide emissions.

Since 1990, the growth in carbon dioxide emissions attributable to the residential sector has averaged 1.8 percent per year. Residential sector emissions in 2005 were 300.1 MMT higher than in 1990, representing 31 percent of the total increase in unadjusted U.S. energy-related carbon dioxide emissions since 1990. Long-term trends in residential carbon dioxide emissions are strongly influenced by demographic factors, living space attributes, and building shell and appliance efficiency choices. For example, the movement of population into warmer climates tends to increase summer air

conditioning consumption and promote the use of electric heat pumps, which increases emissions from electricity use (although the increase could be offset by a reduction in emissions from heating fuel combustion). Growth in the number of households, resulting from increasing population and immigration, also contributes to more residential energy consumption.

## Commercial Sector

Commercial sector carbon dioxide emissions, at 1,050.6 MMT, accounted for about 18 percent of total energy-related carbon dioxide emissions in 2005, of which 78 percent (821.1 MMT) is the sector's pro-rated share of electricity-related emissions (Table 8). Natural gas contributes 16 percent and petroleum 5 percent of the sector's emissions.

Commercial sector emissions largely have their origin in the lighting, space heating, and space cooling requirements of commercial structures, such as office buildings, shopping malls, schools, hospitals, and restaurants. Lighting is a significantly more important component of energy demand in the commercial sector (approximately 20 percent of total demand in 2004) than it is in the residential sector (approximately 12 percent of total demand in 2004). Heating and cooling demand accounted for approximately 40 percent of energy demand in the residential sector in 2004, and about 18 percent in the commercial sector.<sup>40</sup> Thus, commercial sector emissions are affected less by the weather than are residential sector emissions. In the longer run, because commercial activity is a factor of the larger economy, emissions from the commercial sector are more affected by economic trends and less affected by population growth than are emissions from the residential sector.

Emissions attributable to the commercial sector's pro-rated share of electricity consumption increased by 2.6 percent in 2005, and emissions from the direct combustion of fuels (dominated by natural gas, as in the residential sector) decreased by 2.0 percent. Overall, carbon dioxide emissions related to commercial sector activity increased by 1.6 percent—from 1,034.1 to 1,050.6 MMT—between 2004 and 2005 (Table 8). Since 1990, commercial emissions growth has averaged 2.0 percent per year, the largest growth of any end-use sector. Commercial sector carbon dioxide emissions have risen by

<sup>38</sup> Sectoral (residential, commercial, and industrial) energy-related carbon dioxide emissions include the share of total electric power sector carbon dioxide emissions that can be attributed to each end-use sector. The share is based on the percentage of total electricity sales purchased by the sector and losses attributed to the sector. (For values used to calculate sectoral shares, see Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035, Tables 2.2, 2.3, 2.4, and 2.5, web site [www.eia.doe.gov/emeu/mer/consump.html](http://www.eia.doe.gov/emeu/mer/consump.html).) All carbon dioxide emissions associated with industrial or commercial enterprises whose primary business is not the production of electricity are allocated to the sectors in which they occur.

<sup>39</sup> Energy Information Administration, *Short-Term Energy Outlook* (Washington, DC, July 2006), Appendix A, Table A2, p. 2, web site [www.eia.doe.gov/emeu/steo/pub/pdf/a2tab.pdf](http://www.eia.doe.gov/emeu/steo/pub/pdf/a2tab.pdf).

<sup>40</sup> Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006) (Washington, DC, February 2006), Table A5, web site [www.eia.doe.gov/oiaf/aeo/excel/aeo\\_base.xls](http://www.eia.doe.gov/oiaf/aeo/excel/aeo_base.xls).

269.9 MMT since 1990, accounting for 28 percent of the total increase in U.S. unadjusted energy-related carbon dioxide emissions.

### Industrial Sector

Industrial sector emissions, at 1,682.3 MMT carbon dioxide, accounted for 28 percent of total U.S. energy-related carbon dioxide emissions in 2005. In terms of fuel shares, electricity consumption was responsible for 39 percent of total industrial sector emissions (662.8 MMT), natural gas for 24 percent (399.7 MMT), petroleum for 26 percent (431.2 MMT), and coal for 11 percent (184.5 MMT).

Estimated 2005 energy-related carbon dioxide emissions in the industrial sector, at 1,682.3 MMT (Table 9), were 3.1 percent lower than the 2004 emissions level of 1,736.0 MMT. Carbon dioxide emissions attributable to industrial sector energy consumption, while fluctuating from year to year, have decreased slightly since 1990. Total energy-related industrial emissions in 2005 were 0.1 percent (1.3 MMT) lower than in 1990, despite a much larger economy.

A contributing factor to the negative growth in industrial sector carbon dioxide emissions is the erosion of the older energy-intensive (and specifically coal-intensive) industrial base. For example, coke plants consumed 38.9 million short tons of coal in 1990, as compared with 23.4 million short tons in 2005. Other industrial coal consumption declined from 76.3 million short tons in 1990 to 60.8 million short tons in 2005. Also, the share of manufacturing activity represented by less energy-intensive industries, such as computer chip and electronic component manufacturing, has increased while the share represented by energy-intensive industries has fallen.

### Transportation Sector

Carbon dioxide emissions from the transportation sector, at 1,958.6 MMT, accounted for 33 percent of total U.S. energy-related carbon dioxide emissions in 2005. Almost all (98 percent) of transportation sector emissions result from the consumption of petroleum products: motor gasoline, at 60 percent of total transportation sector emissions; middle distillates (diesel fuel) at 22 percent; jet fuel at 12 percent of the total; and residual oil (i.e., heavy fuel oil, largely for maritime use) at 3.3 percent of the sector's total emissions. Motor gasoline is used primarily in automobiles and light trucks, and middle distillates are used in heavy trucks, locomotives, and ships.

Emissions attributable to the transportation sector increased by 1.0 percent in 2005, from 1,939.2 MMT carbon dioxide in 2004 to 1,958.6 MMT in 2005 (Table 10). The fuel-use patterns and related emissions sources in

the transportation sector are different from those in the other end-use sectors. By far the largest single source of emissions, motor gasoline, at 1,170.5 MMT carbon dioxide, increased by 0.1 percent. Emissions from motor gasoline were partially offset by a 13.7-percent increase in the consumption of ethanol (about 2 percent of the market). Carbon dioxide emissions from ethanol consumption are considered to be zero, because the carbon in the fuel is derived primarily from corn, and it is assumed that an equivalent amount of carbon will be sequestered during the corn-growing season. (See the box on page 20 for a discussion of the net emissions benefits of ethanol consumption.)

Since 1990, carbon dioxide emissions related to the transportation sector have increased at an average annual rate of 1.5 percent. The growth since 1990 has meant that transportation emissions have increased by 391.8 MMT, representing 41 percent of the growth in unadjusted energy-related carbon dioxide emissions from all sectors. Transportation is the largest contributing end-use sector to total emissions.

### Electric Power Sector

**Electric Power Sector Carbon Dioxide Emissions by Fuel Input, 1990-2005**

Fuel	Million Metric Tons Carbon Dioxide		Percent Change	
	1990	2005	1990- 2005	2004- 2005
Petroleum	100.9	100.3	-0.6%	2.3%
Natural Gas	176.9	318.9	80.3%	7.7%
Coal	1,519.1	1,944.2	28.0%	2.1%
Total	1,803.1	2,375.0	31.7%	2.8%

The data in Table 11 represent estimates of carbon dioxide emissions for the electric power sector. These emissions when taken as a whole account for 40 percent of total U.S. energy-related carbon dioxide emissions; in calculating sector-specific emissions, electric power sector emissions are distributed to the end-use sectors. The electric power sector includes traditional regulated utilities, as well as independent power producers whose primary business is the generation and sale of electricity. The industrial sector and, to a much lesser extent, the commercial sector also include establishments that generate electricity; however, their primary business is not electricity generation, and so their electricity-related emissions are included in the totals for those sectors, not in the electric power sector.



## Energy-Related Carbon Dioxide Emissions in Manufacturing

Manufacturing is the single largest source of energy-related carbon dioxide emissions in the U.S. industrial sector, which also includes agriculture, forestry, fisheries, mining, and construction. The manufacturing subsector accounted for about 84 percent of energy-related carbon dioxide emissions and 90 percent of energy consumption in the industrial sector in 2002. The table below shows estimates of energy-related carbon dioxide emissions from manufacturing in 2002, based on end-use energy consumption statistics from EIA's Manufacturing Energy Consumption Survey (MECS), which surveys more than 15,000 manufacturing plants every 4 years. The most recent MECS data available are from the 2002 survey. The table on page 18 shows estimates of manufacturing emissions by fuel, based on statistics from the 1991, 1998, and 2002 surveys.

The 1991 MECS reported energy consumption (for fuel and nonfuel purposes) that yielded carbon dioxide emissions from the manufacturing subsector as a whole totaling 1,251.4 million metric tons. The corresponding estimate for 2002 is 1,401.2 million metric tons—an increase of 149.8 million metric tons, representing an average increase of 1.0 percent per year. Over the same interval, the demand for manufacturing products (as measured by gross output<sup>a</sup>) increased by 1.3 percent per year. Therefore, the overall carbon intensity of U.S. manufacturing, measured as metric tons of carbon dioxide emitted per million chained 2000 dollars of gross output, was 420.4 in 1991 but had dropped to 358.4 by 2002, representing an average decrease of 1.4 percent per year.

The *overall carbon intensity* of the U.S. manufacturing subsector is the ratio of its total carbon dioxide emissions (C) to manufacturing output (Y), as measured by the gross output (in chained 2000 dollars). That ratio (C/Y) can be calculated as the product of the subsector's aggregate *carbon intensity of energy supply*—carbon dioxide emissions (C) per unit of energy consumed (E)—and its *energy intensity*—energy consumed (E) per unit of gross output (Y). That is:

$$C/Y = (C/E) \times (E/Y)$$

For the manufacturing subsector as a whole, energy intensity (the ratio  $E/Y$ ) is a function primarily of the energy intensities of different production groups and their contributions to the total gross output mix in the subsector. The subsector's carbon intensity of energy supply (the ratio  $C/E$ ) is determined primarily by the mix of energy fuel inputs and the mix of fuel and nonfuel (sequestering) uses of the inputs. Thus, the overall carbon intensity of manufacturing (C/Y) is a combination of the energy intensity of manufacturing gross output and the carbon intensity of the energy consumed to meet manufacturing energy demand.<sup>b</sup>

The manufacturing  $E/Y$  ratio fell by 1.2 percent per year from 1991 to 2002; however, the reduction was largely the result of a structural shift (i.e., a change in relative market shares in the subsector). The energy intensity for the "other manufacturing" category declined by 1.6 percent per year, and at the same time its gross output grew by 3.2 percent per year, from

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### Carbon Dioxide Emissions from Manufacturing by Industry Group, 2002

Industry Group	NAICS <sup>a</sup> Code	Carbon Dioxide Emissions (Million Metric Tons)	Share of Total Manufacturing Emissions (Percent)	Carbon Intensity of Energy Supply (Million Metric Tons per Quadrillion Btu of Energy Consumed)
Petroleum . . . .	324	304.8	21.8	43.2
Chemicals . . . .	325	311.0	22.2	41.5
Metals . . . . .	331	212.8	15.2	68.7
Paper . . . . .	322	102.4	7.3	36.5
Minerals . . . . .	327	91.1	6.5	68.1
Other Manufacturing . . .		379.0	27.0	54.6
<b>Total . . . . .</b>		<b>1,401.2</b>	<b>100.0</b>	<b>49.5</b>

<sup>a</sup>North American Industry Classification System. For emissions by 6-digit NAICS categories, see web site [www.eia.doe.gov/oiaf/1605/ggrrpt/pdf/industry\\_mecs.pdf](http://www.eia.doe.gov/oiaf/1605/ggrrpt/pdf/industry_mecs.pdf).

Sources: Energy Information Administration, Form EIA-846, "Manufacturing Energy Consumption Survey," and Form EIA-810, "Monthly Refinery Report" (2002).

<sup>a</sup>Consists of sales, or receipts, and other operating income, plus commodity taxes and changes in inventories.

<sup>b</sup>The ratios presented here are estimated as aggregations of several manufacturing industries. Specifically, 22 manufacturing industry groups were aggregated into 6 groups for calculations of industry-specified  $E/Y$  and  $C/Y$  ratios. Therefore, quantifying influences on the change in overall carbon intensity is valuable to extent that these groupings represent changes in the U.S. manufacturing sector. It should be noted, however, that these ratios are based on survey data that are subject to sampling errors and other uncertainties.

## Energy-Related Carbon Dioxide Emissions in Manufacturing (Continued)

### Carbon Dioxide Emissions from Manufacturing by Fuel, 1991, 1998, and 2002

Fuel Type	NAICS <sup>a</sup> Code					Other Mfg.	Total
	324	325	331	322	327		
1991							
Carbon Dioxide Emissions (Million Metric Tons)							
Petroleum . . . . .	149.9	42.1	3.4	13.6	6.4	14.1	229.6
Natural Gas . . . . .	44.2	102.3	37.4	29.1	20.1	73.4	306.6
Coal . . . . .	1.4	25.2	83.2	28.3	27.9	27.2	193.2
Electricity . . . . .	19.8	83.1	94.3	38.0	19.8	192.7	447.8
Other . . . . .	61.0	9.7	3.0	0.2	0.0	0.5	74.3
<b>Total . . . . .</b>	<b>276.3</b>	<b>262.4</b>	<b>221.3</b>	<b>109.2</b>	<b>74.3</b>	<b>307.8</b>	<b>1,251.4</b>
Share of Total Gross Output (Percent) . . . . .	7.1	12.4	4.4	5.1	2.4	68.6	100.0
Share of Total Energy Use (Percent) . . . . .	24.8	23.3	13.2	11.9	4.5	22.3	100.0
Share of Total Carbon Dioxide Emissions (Percent) . .	22.1	21.0	17.7	8.7	5.9	24.6	100.0
1998							
Carbon Dioxide Emissions (Million Metric Tons)							
Petroleum . . . . .	174.8	56.5	3.6	15.1	6.7	13.4	270.1
Natural Gas . . . . .	53.2	127.7	47.9	31.1	23.4	91.5	374.9
Coal . . . . .	0.0	26.9	94.3	25.8	27.7	23.7	198.3
Electricity . . . . .	22.9	103.2	101.8	45.6	24.4	263.7	561.6
Other . . . . .	69.5	4.9	3.4	0.8	0.7	1.6	80.9
<b>Total . . . . .</b>	<b>320.4</b>	<b>319.2</b>	<b>251.0</b>	<b>118.4</b>	<b>82.9</b>	<b>393.9</b>	<b>1,485.8</b>
Share of Total Gross Output (Percent) . . . . .	5.7	11.0	4.2	4.2	2.4	72.5	100.0
Share of Total Energy Use (Percent) . . . . .	25.2	24.0	7.4	10.8	4.1	28.5	100.0
Share of Total Carbon Dioxide Emissions (Percent) . .	21.6	21.5	16.9	8.0	5.6	26.5	100.0
2002							
Carbon Dioxide Emissions (Million Metric Tons)							
Petroleum . . . . .	153.9	70.2	2.4	10.0	11.4	9.6	257.6
Natural Gas . . . . .	46.4	106.2	37.2	26.6	22.3	87.3	325.9
Coal . . . . .	19.3	32.8	72.4	22.5	30.1	25.6	202.8
Electricity . . . . .	24.6	99.4	93.8	42.4	26.8	253.7	540.7
Other . . . . .	60.8	2.4	7.0	0.8	0.4	2.8	74.2
<b>Total . . . . .</b>	<b>304.8</b>	<b>311.0</b>	<b>212.8</b>	<b>102.4</b>	<b>91.1</b>	<b>379.0</b>	<b>1,401.2</b>
Share of Total Gross Output (Percent) . . . . .	5.9	10.5	3.6	3.9	2.2	73.9	100.0
Share of Total Energy Use (Percent) . . . . .	24.9	26.5	10.9	8.4	4.7	24.5	100.0
Share of Total Carbon Dioxide Emissions (Percent) . .	21.8	22.2	15.2	7.3	6.5	27.0	100.0

<sup>a</sup>North American Industry Classification System: 324, petroleum products; 325, chemicals; 331, primary metals; 322, paper; 327, nonmetallic minerals (includes stone, clay, and glass).

Notes: Totals may not equal sum of components due to independent rounding. To calculate intensity and consumption values, electricity was calculated as primary electricity: 10,436 Btu per kilowatthour for 1991, 10,197 for 1998, and 10,173 for 2002. These conversion factors represent the average energy input to the generation process for fossil-fired utility plants in the United States. See Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(2003/09) (Washington, DC, September 2003), Table A6.

Sources: Energy Information Administration, Form EIA-846, "Manufacturing Energy Consumption Survey," and Form EIA-810, "Monthly Refinery Report" (1991, 1998, and 2002); and U.S. Department of Commerce, Bureau of Economic Analysis, Industry Economics Division.

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### Energy-Related Carbon Dioxide Emissions in Manufacturing (Continued)

\$2.0 trillion in 1991 to \$2.9 trillion in 2002 (in chained 2000 dollars), as newer, less energy-intensive industries accounted for an increasing share of manufacturing activity. In 1991 the four most energy-intensive industries (petroleum, chemicals, primary metals, and paper) accounted for 29.0 percent of total manufacturing gross output, but by 2002 their share had fallen to 23.9 percent. For three of the six manufacturing categories, energy intensity increased from 1991 to 2002 (petroleum by 0.4 percent per year, chemicals 1.5 percent, and nonmetallic minerals 0.1 percent). For paper, primary metals, and other manufacturing, energy intensity declined by 0.4 percent, 0.9 percent, and 1.6 percent per year, respectively.

The mix and quantity of energy fuels consumed by manufacturers (for both fuel and nonfuel uses) affect the subsector's aggregate carbon intensity of energy supply. Overall, manufacturing industries had *C/E* ratios equal to 50.9 million metric tons carbon dioxide equivalent per quadrillion Btu in 1991 and 49.5 million metric tons carbon dioxide equivalent per quadrillion Btu in 2002; however, the carbon dioxide factors of the various industries differed markedly.

The petroleum and chemical industries both transform some energy products into products that sequester carbon, such as petrochemical feedstocks, asphalt, and plastics. Because of that use, both the petroleum and chemical industries have lower aggregate *C/E* ratios than the manufacturing average (45.3 and 43.2 million metric tons carbon dioxide equivalent per quadrillion Btu for the petroleum industry and 45.8 and

41.5 for the chemicals industry in 1991 and 2002, respectively).

The paper industry makes extensive use of wood byproducts as an energy source. Carbon dioxide emissions from wood consumption are considered to be zero, because the carbon that is emitted has been sequestered recently, and the regrowing of trees will again sequester an equivalent amount of carbon dioxide. Consequently, the paper industry has a relatively low *C/E* ratio, at 37.4 and 36.5 million metric tons carbon dioxide equivalent per quadrillion Btu in 1991 and 2002, respectively. In contrast, the primary metals industry, which uses large amounts of coal and other carbon-intensive fuels (e.g., electricity), has a high *C/E* ratio: 68.2 in 1991 and 68.7 in 2002.

Between 1998 and 2002, manufacturing industries had decreases in carbon dioxide emissions associated with their use of electricity (20.9 million metric tons) and natural gas (49.0 million metric tons). Even so, electricity use continues to account for the largest share of manufacturers' energy-related carbon dioxide emissions: 37.8 percent (561.6 million metric tons) in 1998 and 38.6 percent (540.7 million metric tons) in 2002.

As a result of the above changes in energy intensity, in combination with the structural shift in the subsector, the overall manufacturing energy intensity (*E/Y*) declined by 1.2 percent per year from 1991 to 2002. When the influence of the structural shift is removed, however, decomposition analysis suggests that the aggregate energy intensity of the manufacturing sector is virtually unchanged.<sup>c</sup>

#### Changes in Key Measures of Carbon Intensity in Manufacturing, 1991-2002

Industry Group	NAICS <sup>a</sup> Code	1991			2002			Annual Percent Change, 1991-2002		
		<i>E/Y</i>	<i>C/E</i>	<i>C/Y</i>	<i>E/Y</i>	<i>C/E</i>	<i>C/Y</i>	<i>E/Y</i>	<i>C/E</i>	<i>C/Y</i>
Petroleum .....	324	29	45.3	1,310.6	30	43.2	1,312.2	0.4	-0.4	0.0
Chemicals .....	325	15	45.8	708.0	18	41.5	758.0	1.5	-0.9	0.6
Metals .....	331	25	68.2	1,688.3	22	68.7	1,532.2	-0.9	0.1	-0.9
Paper .....	322	19	37.4	717.9	18	36.5	668.2	-0.4	-0.2	-0.6
Minerals .....	327	15	67.8	1,048.2	16	68.1	1,058.7	0.1	0.0	0.1
Other Manufacturing .....	3	56.1	150.8	2	58.3	131.2	-1.6	-0.3	-1.3	
<b>Total .....</b>		<b>8</b>	<b>50.9</b>	<b>420.4</b>	<b>7</b>	<b>49.5</b>	<b>358.4</b>	<b>-1.2</b>	<b>-0.3</b>	<b>-1.4</b>
<b>Total Without Structural Shift ..</b>		<b>8</b>	<b>NA</b>	<b>NA</b>	<b>8</b>	<b>NA</b>	<b>NA</b>	<b>-0.1</b>	<b>NA</b>	<b>NA</b>

<sup>a</sup>North American Industry Classification System.

Notes: *E/Y* = energy consumed (thousand Btu) per chained 2000 dollar value of gross output. *C/E* = million metric tons carbon dioxide emitted per quadrillion Btu of energy consumed. *C/Y* = metric tons carbon dioxide emitted per million chained 2000 dollars of gross output. NA = not applicable. Annual percent change for *E/Y* is not statistically significant.

Sources: Energy Information Administration, Form EIA-846, "Manufacturing Energy Consumption Survey," and Form EIA-810, "Monthly Refinery Report" (1991 and 2002).

<sup>c</sup>There are several approaches that, based on index number theory, can be used to decompose aggregate values. The values reported here are based on a discrete approximation of the Divisia integral index.

Preliminary estimates indicate that carbon dioxide emissions from the electric power sector increased by 2.8 percent (65.6 MMT), from 2,309.4 MMT in 2004 to 2,375.0 MMT in 2005 (Table 11). Emissions from natural-gas-fired generation increased by 7.7 percent, from coal-fired generation by 2.1 percent, and from petroleum-fired generation by 2.3 percent. Carbon dioxide emissions from the electric power sector have grown by 32 percent since 1990, while total unadjusted energy-related carbon dioxide emissions have grown by 19 percent. Of the total growth in energy-related carbon dioxide emissions from 1990 to 2005, 60 percent can be attributed to growth in electric power sector emissions.

## Nonfuel Use of Energy Inputs

Nonfuel uses of energy fuels, principally petroleum products, both emit and sequester carbon dioxide over their life cycles. In 2005, nonfuel uses of fossil fuels resulted in emissions of 106.4 MMT carbon dioxide, a decrease of 5.2 MMT (4.7 percent) from the 2004 level of 111.7 MMT (Table 12). Carbon dioxide emissions from nonfuel uses, which represent about 2 percent of total U.S. carbon dioxide emissions, have grown by an average of 0.5 percent annually from their 1990 level of 98.1 MMT. Emissions from nonfuel uses of petroleum products in 2005 were 82.4 MMT in the industrial sector and

### Ethanol and Greenhouse Gas Emissions

Because the carbon in biogenic material is part of the natural carbon cycle, using ethanol in place of gasoline has the potential to reduce greenhouse gas (GHG) emissions. The nature of the impacts could vary greatly, however, depending on the fuels, feedstocks, and processes used to produce the ethanol.

For this report, Argonne National Laboratory produced a life-cycle ("well to wheels") comparison of GHG emissions for conventional motor gasoline and ethanol per gallon of fuel consumed, on a Btu equivalent basis. As shown in the figure below, there is substantial variation in the potential GHG savings for ethanol as compared with motor gasoline. The analysis, based on the near future (2010), compared an outcome based on the current industry average with what could be technically feasible for 2010. Key inputs for

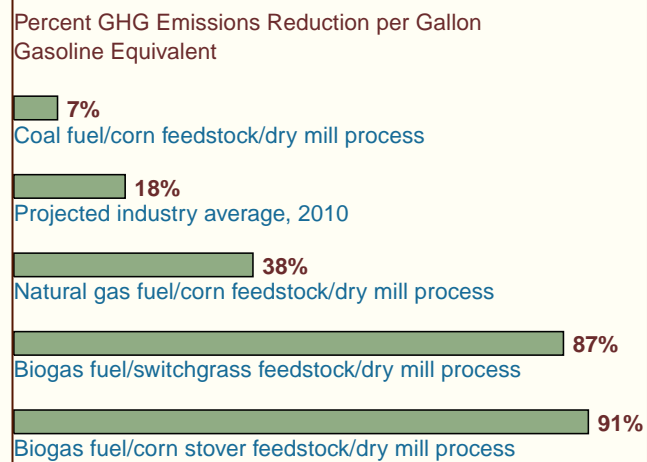
the analysis included: corn yield (bushels per acre); nitrogen fertilizer application rate (pounds per acre); nitrogen fertilizer production (Btu per pound); corn ethanol conversion rate (gallons per bushel); ethanol conversion process (Btu per gallon); total energy use (Btu per gallon); and coproduct energy credits (Btu per gallon).

Among the simulations performed, the smallest savings in GHG emissions when ethanol is used are 7 percent (for an ethanol plant using coal as the input fuel, corn as the energy crop feedstock, and a dry mill production process). The comparison based on the projected industry average for ethanol production in 2010<sup>b</sup> shows savings in GHG emissions of about 18 percent. When a dry mill process is assumed with 100 percent natural gas as the input fuel and corn as the energy crop, the potential savings are about 38 percent.

The higher GHG emissions savings are estimated to occur when the input fuel is renewable and the energy crop is cellulosic rather than corn. With a biogas fuel input and switchgrass as the energy crop, the potential savings are estimated at about 87 percent; with corn stover as the energy crop, the savings are estimated to be more than 90 percent.

The intent of this analysis was not to weigh in on a particular position with regard to the feasibility of the scenarios examined. It is clear, however, that input assumptions are significant in any examination of the potential for GHG emissions savings from the use of ethanol as a transportation fuel. The analysis examined neither economic feasibility nor issues of scale-up to meet a targeted market share, and the future technologies and crop inputs assumed in the analysis remain untested on a national scale.

#### Potential Reductions in Greenhouse Gas Emissions Resulting from U.S. Ethanol Use, 2010



Source: Argonne National Laboratory, GREET Model runs (transmitted on October 4, 2006).

<sup>a</sup>The industry average in 2010 is projected to be 30 percent wet and 70 percent dry process, with an input fuel mix of 72 percent natural gas, 18 percent coal, and 10 percent electricity for a dry mill plant and a fuel mix of 60 percent natural gas and 40 percent coal for a wet mill plant.



5.6 MMT in the transportation sector. Within the industrial petroleum products category, the leading carbon dioxide emission sources were petrochemical feedstocks at 38.0 MMT and LPG at 18.3 MMT. Nonfuel uses of natural gas resulted in emissions of 18.0 MMT carbon dioxide in 2005.

In 2005, carbon sequestration through nonfuel uses of fossil fuels totaled 300.9 MMTCO<sub>2</sub>e (Table 13). The vast majority was sequestered in petroleum-based products, including 276.1 MMTCO<sub>2</sub>e in the industrial sector and 5.6 MMTCO<sub>2</sub>e in the transportation sector sequestered through the use of petroleum-based lubricants. Smaller amounts of carbon were sequestered in natural-gas-based products (17.7 MMTCO<sub>2</sub>e) and coal-based products (1.5 MMTCO<sub>2</sub>e). The main products that sequester carbon include asphalt and road oil (100.0 MMTCO<sub>2</sub>e), LPG (73.4 MMTCO<sub>2</sub>e), and feedstocks for plastics and other petrochemicals (64.2 MMTCO<sub>2</sub>e). The amount sequestered in 2005 was 3.3 percent less than in 2004, when 311.1 MMTCO<sub>2</sub>e was sequestered. Since 1990, the annual sequestration of carbon in this manner has increased by 49.7 MMTCO<sub>2</sub>e or 20 percent. This translates to an average annual growth rate of 1.2 percent.

## Adjustments to Energy Consumption

Total energy consumption and the carbon dioxide emissions upon which they are based correspond to EIA's coverage of energy consumption, which includes the 50 States and the District of Columbia. Under the United Nations Framework Convention on Climate Change (UNFCCC), however, the United States is also responsible for counting emissions emanating from its Territories, and their emissions are added to the U.S. total. Conversely, because the Intergovernmental Panel on Climate Change (IPCC) definition of energy consumption excludes international bunker fuels from the statistics of all countries, emissions from international bunker fuels are subtracted from the U.S. total. Additionally, military bunker fuels are subtracted because they are also excluded by the IPCC from the national total. These sources and subtractions are enumerated and described as "adjustments to energy."

### U.S. Territories

Energy-related carbon dioxide emissions for the U.S. Territories are added as an adjustment in keeping with IPCC guidelines for national emissions inventories. The Territories included are Puerto Rico, the U.S. Virgin Islands, American Samoa, Guam, the U.S. Pacific

Islands, and Wake Island. Most of these emissions are from petroleum products; however, Puerto Rico and the Virgin Islands consume coal in addition to petroleum products. For 2005, total energy-related carbon dioxide emissions from the U.S. Territories are estimated at 58.6 MMT (Table 5).

### International Bunker Fuels

In keeping with the IPCC guidelines for estimating national greenhouse gas emissions, carbon dioxide emissions from international bunker fuels are subtracted from the estimate of total U.S. energy-related emissions of carbon dioxide. Purchases of distillate and residual fuels by foreign-bound ships at U.S. seaports, as well as jet fuel purchases by international air carriers at U.S. airports, form the basis of the estimate for bunker fuels. Additionally, U.S. military operations for which fuel was originally purchased in the United States but consumed in international waters or airspace are subtracted from the total, because they are also considered international bunker fuels under this definition.

For 2004, the carbon dioxide emissions estimate for military bunker fuels was 10.1 MMT.<sup>41</sup> In 2005, approximately 100.7 MMT carbon dioxide was emitted in total from international bunker fuels, including 90.6 MMT attributed to civilian consumption of bunker fuels. The total amount is subtracted from the U.S. total in Table 5. Just over one-half of the carbon dioxide emissions associated with international bunker fuels comes from the combustion of jet fuels; residual and distillate fuels account for the other half, with most coming from residual fuel.

## Other Carbon Dioxide Emissions

### Energy Production

In addition to emissions resulting from fossil energy consumed, oil and gas production leads to emissions of carbon dioxide from sources other than the combustion of those marketed fossil fuels. The two energy production sources estimated for this report are:

- Flared natural gas (gas burned at the production site), which is flared either because the cost of bringing the gas to market is prohibitive or because the gas is of insufficient quality to sell
- Carbon dioxide scrubbed from natural gas to improve its heat content and quality and subsequently vented to the atmosphere.

<sup>41</sup>Data for 2005 military bunker fuels were not available at the time of publication. It should also be noted that only bunker fuels purchased in the United States are subject to adjustment.

**U.S. Carbon Dioxide Emissions from Other Sources, 1990-2005**

Estimated 2005 Emissions (Million Metric Tons Carbon Dioxide)	105.4
Change Compared to 2004 (Million Metric Tons Carbon Dioxide)	-0.2
Change from 2004 (Percent)	-0.2%
Change Compared to 1990 (Million Metric Tons Carbon Dioxide)	17.1
Change from 1990 (Percent)	19.4%

Because many States require flaring of natural gas, EIA assumes that all gas reported under the category “Vented and Flared” is actually flared and therefore should be counted as carbon dioxide emissions rather than methane emissions. In 2005, about 5.9 MMT carbon dioxide was emitted in this way (Table 5).

By computing the difference between the estimated carbon dioxide content of raw gas and the carbon dioxide content of pipeline gas, the amount of carbon dioxide that has been removed (scrubbed) in order to improve the heat content and quality of natural gas can be calculated. This amount was about 17.3 MMT in 2005 (Table 5).

Information on energy production sources that are excluded from this report because of insufficient data is available in Energy Information Administration, *Documentation for Emissions of Greenhouse Gases in the United States 2004*.<sup>42</sup>

## Industrial Process Emissions

Industrial emissions of carbon dioxide not caused by the combustion of fossil fuels accounted for 1.2 percent (74.0 MMT) of total U.S. carbon dioxide emissions in 2005 (Table 14). Process-related emissions from industrial sources depend largely on the level of activity in the construction industries and on production at oil and gas wells. These sources include limestone and dolomite calcination, soda ash manufacture and consumption, carbon dioxide manufacture, cement manufacture, and aluminum production.

Estimated industrial process emissions of carbon dioxide in 2005 totaled 74.0 MMT, 13.9 MMT (23 percent) higher than in 1990 and 0.3 MMT (0.3 percent) lower than in 2004 (Table 14). Of the total estimate for carbon dioxide emissions from industrial processes in 2005, 62 percent is attributed to cement manufacture. When calcium carbonate is heated (calcined) in a kiln, it is converted to lime and carbon dioxide. The lime is combined with other materials to produce clinker (an intermediate product from which cement is made), and the carbon dioxide is released to the atmosphere. In 2005, the United States produced an estimated 97.4 million metric tons of cement,<sup>43</sup> resulting in the direct release of 45.9 MMT into the atmosphere. This calculation is independent of the carbon dioxide released by the combustion of energy fuels consumed in making cement. The estimate for 2005 represents an increase in carbon dioxide emissions of 12.5 MMT (38 percent) compared with 1990 and an increase of about 0.2 MMT (0.4 percent) compared with 2004.

Collectively, in 2005, industrial processes other than cement manufacture emitted 28.1 MMT carbon dioxide. Limestone manufacture and consumption emitted 18.3 MMT, soda ash manufacture 3.9 MMT, aluminum manufacture 3.7 MMT, carbon dioxide manufacture 1.6 MMT, and soda ash consumption 0.6 MMT.

## Waste Combustion

Waste that is combusted contains, on average, a portion that is composed of plastics, synthetic rubber, synthetic fibers, and carbon black. The carbon in these plastics has normally been accounted for as sequestered carbon, as reported in Table 13; however, according to the IPCC, emissions from the plastics contained in municipal solid waste must be counted in total national emissions inventories. The U.S. Environmental Protection Agency (EPA) estimates that plastics and other non-biogenic materials in combusted waste produced emissions of about 19.4 MMT carbon dioxide in 2004 (about 11.1 MMT from grid-connected power generation).<sup>44</sup> The EPA’s 2004 value is used in this report as an estimate for 2005. The difference between the estimated total and EIA’s estimate for the electric power sector is reported in Table 5. For 2005, the difference is 8.3 MMT carbon dioxide.

<sup>42</sup>Energy Information Administration, *Documentation for Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0638(2004) (Washington, DC, November 2006), web site [www.eia.doe.gov/oiaf/1605/ggrpt/documentation/pdf/0638\(2004\).pdf](http://www.eia.doe.gov/oiaf/1605/ggrpt/documentation/pdf/0638(2004).pdf). See also Energy Information Administration, *Documentation for Emissions of Greenhouse Gases in the United States 2005* (to be published).

<sup>43</sup>U.S. Department of the Interior, U.S. Geological Service, “Cement,” *Mineral Commodity Summary*, web site <http://minerals.usgs.gov/minerals/pubs/commodity/cement/cemenmcs06.pdf>.

<sup>44</sup>U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, EPA 430-R-05-003 (Washington, DC, April 2006), web site <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUS EmissionsInventory2006.html>.

**Table 5. U.S. Carbon Dioxide Emissions from Energy and Industry, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Fuel Type or Process	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Energy Consumption</b>										
Petroleum . . . . .	2,169.6	2,192.1	2,345.6	2,413.3	2,443.0	2,461.7	2,457.7	2,499.7	2,597.9	2,614.0
Coal . . . . .	1,781.8	1,878.7	2,022.3	2,023.5	2,119.2	2,051.2	2,054.0	2,092.5	2,115.5	2,141.7
Natural Gas . . . . .	1,027.2	1,184.6	1,189.3	1,191.9	1,237.6	1,185.7	1,227.5	1,196.5	1,198.4	1,178.1
Renewables <sup>a</sup> . . . . .	6.2	10.4	10.6	10.8	10.5	11.1	13.0	11.7	11.4	11.5
<b>Energy Subtotal . . . . .</b>	<b>4,984.8</b>	<b>5,265.8</b>	<b>5,567.8</b>	<b>5,639.5</b>	<b>5,810.2</b>	<b>5,709.8</b>	<b>5,752.2</b>	<b>5,800.5</b>	<b>5,923.2</b>	<b>5,945.3</b>
<b>Nonfuel Use Emissions<sup>b</sup> . . . . .</b>	<b>98.1</b>	<b>104.7</b>	<b>118.6</b>	<b>124.1</b>	<b>110.0</b>	<b>104.9</b>	<b>105.4</b>	<b>103.5</b>	<b>111.7</b>	<b>106.4</b>
<b>Nonfuel Use Sequestration<sup>c</sup> . . . . .</b>	<b>251.2</b>	<b>286.4</b>	<b>314.7</b>	<b>325.8</b>	<b>308.1</b>	<b>293.7</b>	<b>293.8</b>	<b>289.5</b>	<b>311.1</b>	<b>300.9</b>
<b>Adjustments to Energy</b>										
U.S. Territories (+) . . . . .	31.1	38.2	41.0	40.4	42.2	53.6	52.3	56.8	60.0	58.6
Military Bunker Fuels (-) . . . . .	13.6	8.9	10.0	9.8	7.8	8.2	8.1	9.2	10.1	10.1
International Bunker Fuels (-) . . . . .	100.1	91.9	104.9	97.4	93.5	89.6	81.2	75.0	90.1	90.6
<b>Total Energy Adjustments . . . . .</b>	<b>-82.6</b>	<b>-62.6</b>	<b>-73.9</b>	<b>-66.8</b>	<b>-59.1</b>	<b>-44.1</b>	<b>-37.0</b>	<b>-27.5</b>	<b>-40.2</b>	<b>-42.1</b>
<b>Adjusted Energy Subtotal . . . . .</b>	<b>4,902.3</b>	<b>5,203.2</b>	<b>5,494.0</b>	<b>5,572.7</b>	<b>5,751.1</b>	<b>5,665.7</b>	<b>5,715.2</b>	<b>5,773.0</b>	<b>5,883.0</b>	<b>5,903.2</b>
<b>Other Sources</b>										
Natural Gas Flaring . . . . .	9.1	17.2	6.2	6.7	5.5	5.9	6.0	5.9	5.9	5.9
Carbon Dioxide in Natural Gas . . . . .	14.0	16.7	18.0	17.8	18.2	18.6	17.9	18.1	17.8	17.3
Cement Production . . . . .	33.3	36.9	39.3	40.1	41.3	41.5	43.0	43.2	45.7	45.9
Other Industrial . . . . .	26.8	28.4	29.7	29.3	29.4	27.4	26.4	27.6	28.5	28.1
Waste Combustion . . . . .	5.1	6.2	6.9	7.2	7.9	8.0	6.2	7.5	7.7	8.3
<b>Total Other Sources . . . . .</b>	<b>88.3</b>	<b>105.3</b>	<b>100.1</b>	<b>101.2</b>	<b>102.3</b>	<b>101.3</b>	<b>99.5</b>	<b>102.3</b>	<b>105.7</b>	<b>105.4</b>
<b>Total . . . . .</b>	<b>4,990.6</b>	<b>5,308.5</b>	<b>5,594.0</b>	<b>5,673.9</b>	<b>5,853.4</b>	<b>5,767.0</b>	<b>5,814.7</b>	<b>5,875.3</b>	<b>5,988.7</b>	<b>6,008.6</b>

<sup>a</sup>Includes emissions from electricity generation using municipal solid waste and geothermal energy.

<sup>b</sup>Emissions from nonfuel use are included in the fuel categories above. See Table 12 for details by fuel category.

<sup>c</sup>See Table 13 for details by fuel.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding. Adjusted energy total includes U.S. Territories.

Sources: EIA estimates presented in this chapter.

**Table 6. U.S. Carbon Dioxide Emissions from Energy Consumption by End-Use Sector, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

End-Use Sector	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
Residential . . . . .	953.7	1,030.7	1,088.1	1,111.3	1,171.9	1,161.1	1,186.4	1,214.0	1,213.9	1,253.8
Commercial . . . . .	780.7	841.1	935.7	947.7	1,006.4	1,014.2	1,009.4	1,020.3	1,034.1	1,050.6
Industrial . . . . .	1,683.6	1,728.6	1,782.3	1,770.5	1,778.0	1,702.8	1,684.7	1,688.0	1,736.0	1,682.3
Transportation . . . . .	1,566.8	1,665.3	1,761.8	1,810.0	1,854.0	1,831.7	1,871.7	1,878.2	1,939.2	1,958.6
<b>Total<sup>a</sup> . . . . .</b>	<b>4,984.8</b>	<b>5,265.8</b>	<b>5,567.8</b>	<b>5,639.5</b>	<b>5,810.2</b>	<b>5,709.8</b>	<b>5,752.2</b>	<b>5,800.5</b>	<b>5,923.2</b>	<b>5,945.3</b>
Electric Power . . . . .	1,803.1	1,936.8	2,164.9	2,175.8	2,279.3	2,240.2	2,250.0	2,277.4	2,309.4	2,375.0

P = preliminary data.

<sup>a</sup>Includes emissions from nonfuel uses of fossil fuels. See Table 12 for details by fuel category.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding. Electric power sector emissions are distributed across the end-use sectors. Emissions allocated to sectors are unadjusted. Adjustments are made to total emissions only (Table 5).

Sources: EIA estimates presented in this chapter.

**Table 7. U.S. Carbon Dioxide Emissions from Residential Sector Energy Consumption, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Fuel	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Petroleum</b>										
Liquefied Petroleum Gas . .	22.6	25.1	26.9	33.1	34.9	33.2	33.6	34.9	32.9	31.2
Distillate Fuel . . . . .	70.8	65.5	55.9	59.9	65.5	65.8	62.3	65.5	66.9	67.5
Kerosene . . . . .	4.6	5.3	7.8	8.0	6.8	6.8	4.3	5.0	6.1	6.6
<b>Petroleum Subtotal . . . .</b>	<b>98.0</b>	<b>95.9</b>	<b>90.5</b>	<b>101.0</b>	<b>107.2</b>	<b>105.8</b>	<b>100.2</b>	<b>105.5</b>	<b>105.9</b>	<b>105.3</b>
Coal . . . . .	2.9	1.6	1.2	1.3	1.0	1.0	1.1	1.2	1.3	0.9
Natural Gas . . . . .	238.6	263.1	246.6	256.4	269.2	259.0	263.7	276.1	264.8	261.7
Electricity <sup>a</sup> . . . . .	614.2	670.0	749.8	752.6	794.4	795.3	821.4	831.2	841.9	885.7
<b>Total . . . . .</b>	<b>953.7</b>	<b>1,030.7</b>	<b>1,088.1</b>	<b>1,111.3</b>	<b>1,171.9</b>	<b>1,161.1</b>	<b>1,186.4</b>	<b>1,214.0</b>	<b>1,213.9</b>	<b>1,253.8</b>

<sup>a</sup>Share of total electric power sector carbon dioxide emissions weighted by sales to the residential sector.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 8. U.S. Carbon Dioxide Emissions from Commercial Sector Energy Consumption, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Fuel	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Petroleum</b>										
Motor Gasoline . . . . .	7.8	1.3	2.7	2.0	3.1	2.6	3.2	4.2	3.4	3.4
Liquefied Petroleum Gas . .	4.0	4.4	4.7	5.8	6.2	5.9	5.9	6.2	5.8	5.5
Distillate Fuel . . . . .	38.8	34.7	31.1	31.8	35.6	36.8	32.2	34.9	34.1	34.4
Residual Fuel . . . . .	17.9	11.0	6.6	5.7	7.1	5.4	6.2	8.7	9.6	10.5
Kerosene . . . . .	0.8	1.6	2.2	1.9	2.1	2.2	1.1	1.3	1.5	1.6
<b>Petroleum Subtotal . . . .</b>	<b>69.4</b>	<b>53.0</b>	<b>47.4</b>	<b>47.2</b>	<b>54.1</b>	<b>53.0</b>	<b>48.7</b>	<b>55.3</b>	<b>54.3</b>	<b>55.4</b>
Coal . . . . .	11.6	11.0	9.5	9.6	8.1	8.3	8.3	7.8	9.5	7.8
Natural Gas . . . . .	142.4	164.5	163.6	165.3	171.8	164.3	170.2	175.8	170.3	166.3
Electricity <sup>a</sup> . . . . .	557.2	612.6	715.2	725.5	772.4	788.5	782.3	781.4	799.9	821.1
<b>Total . . . . .</b>	<b>780.7</b>	<b>841.1</b>	<b>935.7</b>	<b>947.7</b>	<b>1,006.4</b>	<b>1,014.2</b>	<b>1,009.4</b>	<b>1,020.3</b>	<b>1,034.1</b>	<b>1,050.6</b>

<sup>a</sup>Share of total electric power sector carbon dioxide emissions weighted by sales to the commercial sector.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.



**Table 9. U.S. Carbon Dioxide Emissions from Industrial Sector Energy Consumption, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Fuel	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Petroleum</b>										
Motor Gasoline . . . . .	13.0	14.1	14.0	10.6	10.5	20.7	21.7	22.7	26.1	26.2
Liquefied Petroleum Gas . .	39.9	46.4	40.3	49.3	57.9	50.1	55.8	51.4	56.8	54.4
Distillate Fuel . . . . .	83.1	81.6	87.3	85.5	86.5	93.7	86.8	81.9	87.5	89.1
Residual Fuel . . . . .	30.3	24.2	15.7	14.0	16.6	13.6	13.1	15.5	17.7	19.7
Asphalt and Road Oil . . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lubricants . . . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kerosene . . . . .	0.9	1.1	1.6	0.9	1.1	1.7	1.0	1.7	2.0	2.2
Petroleum Coke . . . . .	81.2	79.6	97.6	109.0	87.6	97.2	94.8	91.6	107.2	102.5
Other Petroleum . . . . .	125.1	112.1	123.6	128.0	115.5	130.0	127.3	137.3	139.8	137.1
<b>Petroleum Subtotal . . . .</b>	<b>373.5</b>	<b>359.1</b>	<b>380.1</b>	<b>397.3</b>	<b>375.7</b>	<b>407.0</b>	<b>400.5</b>	<b>402.2</b>	<b>437.3</b>	<b>431.2</b>
<b>Coal . . . . .</b>	<b>247.7</b>	<b>223.6</b>	<b>203.1</b>	<b>198.6</b>	<b>207.5</b>	<b>201.4</b>	<b>185.2</b>	<b>187.3</b>	<b>188.1</b>	<b>184.5</b>
<b>Coal Coke Net Imports . . .</b>	<b>0.5</b>	<b>5.7</b>	<b>7.4</b>	<b>6.5</b>	<b>6.1</b>	<b>2.7</b>	<b>5.7</b>	<b>4.7</b>	<b>12.8</b>	<b>4.1</b>
<b>Natural Gas . . . . .</b>	<b>433.5</b>	<b>489.4</b>	<b>495.0</b>	<b>473.6</b>	<b>479.7</b>	<b>438.8</b>	<b>450.7</b>	<b>433.5</b>	<b>434.9</b>	<b>399.7</b>
<b>Electricity<sup>a</sup> . . . . .</b>	<b>628.5</b>	<b>650.9</b>	<b>696.6</b>	<b>694.5</b>	<b>708.9</b>	<b>652.9</b>	<b>642.7</b>	<b>660.4</b>	<b>662.9</b>	<b>662.8</b>
<b>Total<sup>b</sup> . . . . .</b>	<b>1,683.6</b>	<b>1,728.6</b>	<b>1,782.3</b>	<b>1,770.5</b>	<b>1,778.0</b>	<b>1,702.8</b>	<b>1,684.7</b>	<b>1,688.0</b>	<b>1,736.0</b>	<b>1,682.3</b>

<sup>a</sup>Share of total electric power sector carbon dioxide emissions weighted by sales to the industrial sector.

<sup>b</sup>Includes emissions from nonfuel uses of fossil fuels. See Table 12 for details by fuel category.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 10. U.S. Carbon Dioxide Emissions from Transportation Sector Energy Consumption, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Fuel	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Petroleum</b>										
Motor Gasoline . . . . .	952.1	1,019.4	1,076.8	1,104.0	1,110.7	1,115.8	1,144.2	1,147.9	1,169.0	1,170.5
Liquefied Petroleum Gas . .	1.3	1.0	1.0	0.8	0.7	0.8	0.8	1.0	1.1	1.1
Jet Fuel . . . . .	220.4	219.9	235.6	242.9	251.2	240.4	234.4	229.1	237.4	243.8
Distillate Fuel . . . . .	265.1	303.8	348.4	362.2	374.0	383.2	390.5	410.3	429.6	434.1
Residual Fuel . . . . .	79.3	71.0	52.6	51.9	69.2	45.7	52.8	44.5	57.7	64.1
Lubricants <sup>a</sup> . . . . .	6.5	6.2	6.6	6.7	6.6	6.0	6.0	5.5	5.6	5.6
Aviation Gasoline . . . . .	3.1	2.7	2.4	2.7	2.5	2.4	2.3	2.1	2.1	2.4
<b>Petroleum Subtotal . . . .</b>	<b>1,527.7</b>	<b>1,624.0</b>	<b>1,723.4</b>	<b>1,771.2</b>	<b>1,815.0</b>	<b>1,794.3</b>	<b>1,831.0</b>	<b>1,840.5</b>	<b>1,902.5</b>	<b>1,921.7</b>
<b>Coal . . . . .</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Natural Gas . . . . .</b>	<b>35.9</b>	<b>38.2</b>	<b>35.1</b>	<b>35.6</b>	<b>35.5</b>	<b>33.9</b>	<b>37.1</b>	<b>33.3</b>	<b>32.1</b>	<b>31.5</b>
<b>Electricity<sup>b</sup> . . . . .</b>	<b>3.2</b>	<b>3.2</b>	<b>3.3</b>	<b>3.2</b>	<b>3.6</b>	<b>3.5</b>	<b>3.6</b>	<b>4.5</b>	<b>4.6</b>	<b>5.4</b>
<b>Total . . . . .</b>	<b>1,566.8</b>	<b>1,665.3</b>	<b>1,761.8</b>	<b>1,810.0</b>	<b>1,854.0</b>	<b>1,831.7</b>	<b>1,871.7</b>	<b>1,878.2</b>	<b>1,939.2</b>	<b>1,958.6</b>

<sup>a</sup>Includes emissions from nonfuel uses of fossil fuels. See Table 12 for details by fuel category.

<sup>b</sup>Share of total electric power sector carbon dioxide emissions weighted by sales to the transportation sector.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 11. U.S. Carbon Dioxide Emissions from Electric Power Sector Energy Consumption, 1990, 1995, and 1998-2005**

(Million Metric Tons Carbon Dioxide)

Fuel	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Petroleum</b>										
Heavy Fuel Oil . . . . .	91.0	44.6	82.7	75.7	68.8	79.3	51.7	68.3	69.1	69.1
Light Fuel Oil. . . . .	7.0	7.8	9.8	10.1	12.6	12.4	9.2	11.6	8.0	8.3
Petroleum Coke . . . . .	2.9	7.7	11.7	10.7	9.5	10.0	16.4	16.4	20.9	22.9
<b>Petroleum Subtotal<sup>a</sup> . .</b>	<b>100.9</b>	<b>60.1</b>	<b>104.1</b>	<b>96.5</b>	<b>90.9</b>	<b>101.6</b>	<b>77.4</b>	<b>96.3</b>	<b>98.0</b>	<b>100.3</b>
<b>Coal . . . . .</b>	<b>1,519.1</b>	<b>1,636.8</b>	<b>1,801.1</b>	<b>1,807.6</b>	<b>1,896.6</b>	<b>1,837.8</b>	<b>1,853.7</b>	<b>1,891.5</b>	<b>1,903.7</b>	<b>1,944.2</b>
<b>Natural Gas . . . . .</b>	<b>176.9</b>	<b>229.4</b>	<b>249.1</b>	<b>260.9</b>	<b>281.4</b>	<b>289.6</b>	<b>305.9</b>	<b>277.9</b>	<b>296.2</b>	<b>318.9</b>
<b>Municipal Solid Waste . .</b>	<b>5.8</b>	<b>10.0</b>	<b>10.2</b>	<b>10.4</b>	<b>10.1</b>	<b>10.8</b>	<b>12.6</b>	<b>11.3</b>	<b>11.1</b>	<b>11.1</b>
<b>Geothermal . . . . .</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.3</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>
<b>Total . . . . .</b>	<b>1,803.1</b>	<b>1,936.8</b>	<b>2,164.9</b>	<b>2,175.8</b>	<b>2,279.3</b>	<b>2,240.2</b>	<b>2,250.0</b>	<b>2,277.4</b>	<b>2,309.4</b>	<b>2,375.0</b>

P = preliminary data.

<sup>a</sup>Includes small amounts of other petroleum liquids, such as jet fuel and waste oil.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Emissions for total fuel consumption are allocated to end-use sectors in proportion to electricity sales. Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 12. U.S. Carbon Dioxide Emissions from Nonfuel Use of Energy Fuels, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

End Use and Type	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Industrial</b>										
Petroleum										
Liquefied Petroleum Gases . . .	14.8	19.5	21.5	22.4	20.4	19.1	19.9	19.0	19.3	18.3
Distillate Fuel . . . . .	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Residual Fuel . . . . .	1.8	2.0	2.2	2.2	2.2	2.2	1.7	1.7	1.7	1.7
Asphalt and Road Oil . . . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lubricants . . . . .	6.8	6.5	7.0	7.1	7.0	6.4	6.3	5.8	5.9	5.9
Other (Subtotal) . . . . .	51.2	51.5	60.6	66.2	53.7	51.4	52.7	52.5	60.2	56.1
Pentanes Plus . . . . .	1.1	4.0	2.7	3.5	3.1	2.7	2.3	2.2	2.3	2.0
Petrochemical Feed . . . . .	33.3	35.7	39.3	37.8	36.4	32.6	33.2	36.2	41.4	38.0
Petroleum Coke . . . . .	9.0	6.7	10.8	14.4	7.1	10.5	9.7	8.3	12.9	11.6
Special Naphtha . . . . .	7.8	5.2	7.8	10.6	7.1	5.7	7.5	5.9	3.7	4.6
Waxes and Miscellaneous . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum Subtotal . . . . .	74.9	79.9	91.7	98.3	83.8	79.5	81.0	79.5	87.6	82.4
Coal . . . . .	0.5	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
Natural Gas . . . . .	16.2	17.9	19.7	18.5	19.0	18.8	18.0	18.0	18.0	18.0
<b>Industrial Subtotal . . . . .</b>	<b>91.6</b>	<b>98.5</b>	<b>112.0</b>	<b>117.4</b>	<b>103.4</b>	<b>98.9</b>	<b>99.5</b>	<b>98.0</b>	<b>106.1</b>	<b>100.9</b>
<b>Transportation</b>										
Lubricants . . . . .	6.5	6.2	6.6	6.7	6.6	6.0	6.0	5.5	5.6	5.6
<b>Total . . . . .</b>	<b>98.1</b>	<b>104.7</b>	<b>118.6</b>	<b>124.1</b>	<b>110.0</b>	<b>104.9</b>	<b>105.4</b>	<b>103.5</b>	<b>111.7</b>	<b>106.4</b>

P = preliminary data.

Notes: Emissions from nonfuel use of energy fuels are included in the energy consumption tables in this chapter. Data in this table are revised from unpublished data used to produce the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 13. U.S. Carbon Sequestered by Nonfuel Use of Energy Fuels, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide Equivalent)

End Use and Type	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Industrial</b>										
Petroleum										
Liquefied Petroleum Gases . . .	59.3	78.5	86.4	89.9	82.1	76.7	79.9	76.3	77.7	73.4
Distillate Fuel . . . . .	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Residual Fuel . . . . .	1.9	2.1	2.2	2.2	2.2	2.2	1.7	1.7	1.7	1.7
Asphalt and Road Oil . . . . .	88.5	89.1	95.5	100.1	96.4	95.0	93.7	92.2	98.6	100.0
Lubricants . . . . .	6.9	6.6	7.1	7.2	7.0	6.5	6.4	5.9	6.0	5.9
Other (Subtotal) . . . . .	72.0	83.0	92.7	94.9	88.7	83.9	86.4	88.1	101.9	94.6
Pentanes Plus . . . . .	4.4	16.2	10.9	14.0	12.7	10.8	9.2	9.0	9.1	8.0
Petrochemical Feed . . . . .	46.0	50.0	59.1	55.5	57.7	50.7	55.1	59.2	69.2	64.2
Petroleum Coke . . . . .	9.1	6.8	10.9	14.5	7.2	10.6	9.8	8.3	13.0	11.7
Special Naphtha . . . . .	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waxes and Miscellaneous . .	12.5	10.1	11.8	10.9	11.2	11.8	12.2	11.5	10.6	10.6
Petroleum Subtotal . . . . .	228.8	259.6	284.3	294.8	277.0	264.7	268.6	264.7	286.3	276.1
Coal . . . . .	1.4	2.1	1.8	1.8	1.8	1.7	1.5	1.5	1.5	1.5
Natural Gas . . . . .	14.4	18.4	21.9	22.5	22.6	21.2	17.7	17.7	17.7	17.7
<b>Industrial Subtotal . . . . .</b>	<b>244.7</b>	<b>280.1</b>	<b>308.0</b>	<b>319.1</b>	<b>301.4</b>	<b>287.6</b>	<b>287.8</b>	<b>283.9</b>	<b>305.5</b>	<b>295.3</b>
<b>Transportation</b>										
Lubricants . . . . .	6.5	6.2	6.7	6.8	6.7	6.1	6.0	5.6	5.6	5.6
<b>Total . . . . .</b>	<b>251.2</b>	<b>286.4</b>	<b>314.7</b>	<b>325.8</b>	<b>308.1</b>	<b>293.7</b>	<b>293.8</b>	<b>289.5</b>	<b>311.1</b>	<b>300.9</b>

P = preliminary data.

Notes: Emissions from nonfuel use of energy fuels are included in the energy consumption tables in this chapter. Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.

**Table 14. U.S. Carbon Dioxide Emissions from Industrial Processes, 1990, 1995, and 1998-2005**  
(Million Metric Tons Carbon Dioxide)

Source	1990	1995	1998	1999	2000	2001	2002	2003	2004	P2005
<b>Cement Manufacture</b>										
Clinker Production . . . . .	32.6	36.1	38.4	39.2	40.4	40.5	42.0	42.2	44.7	44.9
Masonry Cement . . . . .	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cement Kiln Dust . . . . .	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9
<b>Cement Subtotal . . . . .</b>	<b>33.3</b>	<b>36.9</b>	<b>39.3</b>	<b>40.1</b>	<b>41.3</b>	<b>41.5</b>	<b>43.0</b>	<b>43.2</b>	<b>45.7</b>	<b>45.9</b>
<b>Other Industrial</b>										
<b>Limestone Consumption</b>										
Lime Manufacture . . . . .	12.4	14.5	15.8	15.5	15.4	14.8	14.1	15.1	15.7	15.7
Iron Smelting . . . . .	1.7	1.2	1.1	1.0	1.1	1.0	0.9	0.9	1.0	0.7
Steelmaking . . . . .	0.3	0.5	0.4	0.3	0.5	0.6	0.5	0.4	0.4	*
Copper Refining . . . . .	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Glass Manufacture . . . . .	0.1	0.3	0.0	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Flue Gas Desulfurization . . . .	0.7	0.9	1.0	1.1	1.2	1.4	1.4	1.3	1.4	1.5
Dolomite Manufacture . . . . .	0.5	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Limestone Subtotal . . . . .</b>	<b>15.9</b>	<b>17.8</b>	<b>18.7</b>	<b>18.3</b>	<b>18.6</b>	<b>18.1</b>	<b>17.1</b>	<b>18.0</b>	<b>18.9</b>	<b>18.3</b>
Soda Ash Manufacture . . . . .	3.4	3.8	3.8	3.7	3.6	3.6	3.5	3.6	3.8	3.9
<b>Soda Ash Consumption</b>										
Glass Manufacture . . . . .	0.1	0.3	*	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Flue Gas Desulfurization . . . .	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Sodium Silicate . . . . .	0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3
Sodium Tripolyphosphate . . . .	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Soda Ash Subtotal . . . . .</b>	<b>0.5</b>	<b>0.8</b>	<b>0.5</b>	<b>0.6</b>	<b>0.6</b>	<b>0.5</b>	<b>0.4</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>
Carbon Dioxide Manufacture . .	0.9	1.0	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6
Aluminum Manufacture . . . . .	5.9	4.9	5.4	5.5	5.4	3.9	4.0	4.0	3.7	3.7
Shale Oil Production . . . . .	0.2	*	*	*	*	*	*	*	*	*
<b>Other Industrial Subtotal . . .</b>	<b>26.8</b>	<b>28.4</b>	<b>29.7</b>	<b>29.3</b>	<b>29.4</b>	<b>27.4</b>	<b>26.4</b>	<b>27.6</b>	<b>28.5</b>	<b>28.1</b>
<b>Total . . . . .</b>	<b>60.1</b>	<b>65.3</b>	<b>69.0</b>	<b>69.4</b>	<b>70.7</b>	<b>68.9</b>	<b>69.4</b>	<b>70.8</b>	<b>74.2</b>	<b>74.0</b>

\*Less than 50,000 metric tons carbon dioxide.

P = preliminary data.

Notes: Data in this table are revised from the data contained in the previous EIA report, *Emissions of Greenhouse Gases in the United States 2004*, DOE/EIA-0573(2004) (Washington, DC, December 2005). Totals may not equal sum of components due to independent rounding.

Sources: EIA estimates presented in this chapter.